THE BRITISH ASTRONOMICAL ASSOCIATION:COMET SECTION

SECTION NEWSLETTER 1992/1

1992 JANUARY   D.G.BUCZYNSKI

The past year has seen many discoveries of faint periodic comets, mainly by the active team at Palomar headed by the Shoemakers and David Levy. These discoveries are important as they add to the total number of objects to study.

It is however, a sobering thought that the comets discovered by this team are merely by products of a larger programme to discover fast moving asteroids. One wonders how many comets would be discovered if an exclusive search for them were made. The search methods used in this programme seem straightforward, relying on traditional photographic procedures combined with simple stereoscopy.What could be easier? Providing that you have access to a 48 inch Schmidt camera and hundreds of clear nights per year and a determination to do the job, then nothing!

Most of the comets discovered by this team remain faint and unobservable for observers with small to medium sized telescopes, however Comet Shoemaker-Levy 1991a1 holds out a little better promise. With perihelion occuring in July and the comet near the north celestial pole we should be in position to make a good number of observations of this comet. Indeed I propose that we make this comet our primary target during 1992.

There has been concern voiced of late, that cometary observations by amateurs in this country are now at an all time low. This contrasts with the large number of cometary observations being submitted by European observers. Perhaps we in the UK have just got out of the habit! Observers who decided to take a break from cometary observing after P/Halley in 1985/86 must now be "well rested". The time to get back to work has now come! As a Section we must restablish an active observational base. This coming year gives us that opportunity.

The value of visual and photographic observations of comets is a high now as it has ever been. Due to the transitory nature of comets the observational windows are very limited and planning is required to ensure the best return for our efforts. Our coordinators Guy Hurst (visual) and Harold Ridley (photographic) are ready to recieve your observations.Please contact them for advice regarding the Section's observing programmes.Indeed in the absence of the Director until March (Antartic duties) any general enquiries should be forwarded to Guy Hurst.

COMET ZANOTTA-BREWINGTON (1991g1)

Guy Hurst, Assistant Director of the Comet Section reports:

Mauro Vittorio Zanotta, Milan, Italy has telexed details of his discovery of new comet on 1991 Dec 23 and, in response to an alert, confirmation was obtai by Martin Mobberley and Herman Mikuz:

	(2000)		(1950)		m1	Observer
1991 Dec 23.84375UT	20h 44.5m	+19 10′	20h 42.2m	+18 59	9	Zanotta
23.86806	20 45.0	+19 05	20 42.7	+18 54	9	Zanotta
24.719	20 47.5	+18 48	20 45.2	+18 37	9	Mobberley
24.740	20 48.1	+18 45	20 45.8	+18 34	10	Mikuz

Additional Notes:
Mauro Zanotta (Milan, Italy) 0.15-m reflector.
Martin Mobberley (Cockfield, Bury St Edmunds, England)

0.36-m reflector visual. x55, x95. Coma diameter 4′.
Herman Mikuz (Slovenia, Yugoslavia).
0.20-m reflector x40. Coma diameter 4′, DC 6.
Dense approx 2′ diameter central condensation.

Brian Marsden, Central Bureau for Astronomical Telegrams, informs us that th new comet was independently found by H.J.Brewington of Cloudcroft, CN, USA:

	RA (2000)	DEC	m1	Observer
1991 Dec 24.12847	20 47	+18.5	10	Brewington

The following preliminary elements have been obtained from the CBAT Computer Service:

T 1992 Jan 31.8870 TDT	w 197.71903)	
e 1.00000000	O 255.10030)	2000.0
q 0.6442588 A.U.	i 49.96385)	

Source: Positions are geocentric

The following daily ephemeris was calculated using a computer program developed by N.James:

m1 = 9.0 + 5.0 log R + 10.0 log r

Date	R.A. (2000)		Dec.	R	r	Elong	m1	Motion	
	h	m	o ′	(AU)	(AU)	o		"/hr	P.A.
1991 Dec									
29.00	21	3.56	+17 1.6	1.065	0.950	55.1	8.9	151	116
30.00	21	7.39	+16 35.0	1.052	0.936	54.6	8.8	154	116
31.00	21	11.30	+16 7.4	1.039	0.922	54.1	8.7	158	116
1992 Jan									
1.00	21	15.28	+15 38.7	1.025	0.908	53.7	8.6	162	117
2.00	21	19.33	+15 8.7	1.012	0.894	53.2	8.5	166	117
3.00	21	23.45	+14 37.5	0.999	0.881	52.7	8.4	171	118
4.00	21	27.65	+14 5.0	0.986	0.867	52.3	8.3	175	118
5.00	21	31.93	+13 31.0	0.973	0.854	51.8	8.3	179	119
6.00	21	36.27	+12 55.6	0.960	0.841	51.3	8.2	184	119
7.00	21	40.69	+12 18.5	0.947	0.828	50.8	8.1	189	120
8.00	21	45.18	+11 39.7	0.934	0.816	50.3	8.0	193	121
9.00	21	49.75	+10 59.1	0.921	0.804	49.8	7.9	198	121
10.00	21	54.38	+10 16.6	0.908	0.792	49.3	7.8	203	122

11.00	21 59.07	+9 32.1	0.896	0.780	48.8	7.7	208	123
12.00	22 3.83	+8 45.6	0.883	0.769	48.3	7.6	214	124
13.00	22 8.65	+7 56.9	0.871	0.758	47.8	7.5	219	125
14.00	22 13.54	+7 5.9	0.859	0.747	47.2	7.4	224	125
15.00	22 18.47	+6 12.6	0.848	0.737	46.7	7.3	229	126
16.00	22 23.46	+5 16.9	0.836	0.727	46.2	7.2	235	127
17.00	22 28.49	+4 18.7	0.825	0.718	45.7	7.1	240	128
18.00	22 33.57	+3 18.0	0.814	0.709	45.2	7.1	246	129
19.00	22 38.68	+2 14.7	0.804	0.700	44.7	7.0	251	130
20.00	22 43.82	+1 8.9	0.794	0.692	44.2	6.9	256	131
21.00	22 48.99	+0 0.4	0.784	0.685	43.8	6.8	261	132
22.00	22 54.18	-1 10.7	0.775	0.678	43.3	6.8	266	133
23.00	22 59.38	-2 24.3	0.766	0.672	42.9	6.7	270	134
24.00	23 4.59	-3 40.4	0.758	0.666	42.5	6.6	274	135
25.00	23 9.79	-4 58.9	0.750	0.661	42.1	6.6	278	136
26.00	23 14.99	-6 19.7	0.743	0.656	41.8	6.5	281	137
27.00	23 20.17	-7 42.6	0.736	0.653	41.5	6.5	284	137
28.00	23 25.33	-9 7.5	0.730	0.650	41.3	6.4	287	138
29.00	23 30.46	-10 34.2	0.725	0.647	41.1	6.4	289	139
30.00	23 35.56	-12 2.5	0.720	0.646	40.9	6.4	290	140
31.00	23 40.61	-13 32.1	0.716	0.645	40.8	6.4	291	141
1992 Feb								
1.00	23 45.62	-15 2.9	0.712	0.644	40.8	6.4	291	142
2.00	23 50.58	-16 34.4	0.709	0.645	40.8	6.3	290	142
3.00	23 55.49	-18 6.5	0.707	0.646	40.9	6.3	289	143
4.00	0 0.33	-19 39.0	0.705	0.648	41.0	6.4	287	144
5.00	0 5.12	-21 11.4	0.704	0.650	41.2	6.4	285	144
6.00	0 9.84	-22 43.6	0.703	0.653	41.4	6.4	282	145
7.00	0 14.50	-24 15.3	0.703	0.657	41.7	6.4	278	145
8.00	0 19.09	-25 46.3	0.704	0.662	42.1	6.4	274	146
9.00	0 23.63	-27 16.3	0.705	0.667	42.5	6.5	270	146
10.00	0 28.09	-28 45.2	0.706	0.673	43.0	6.5	265	147
11.00	0 32.50	-30 12.7	0.708	0.679	43.5	6.6	260	147

Recent observations received by electronic-mail from our group of European observers:

Date	m1	Coma dia	Instrument	Observer
1991 Dec 26.78UT	9.3	3'	0.15-m reflector	A.Pereira (Portugal)
1991 Dec 26.81UT	9.1	2.5'	0.15-m reflector	C.A.Silva (Portugal)
1991 Dec 28.73UT	9.8	4'	0.20-m reflector	H.Mikuz (Yugoslavia)
1991 Dec 28.74UT	9.6	3.5'	20x60 binoculars	H.Mikuz (Yugoslavia)

The comet should be visible rather low in the northern sky during the next few weeks and is best observed as soon after dark as possible.

Please submit your observations by post to:

Guy M Hurst,
16 Westminster Close,
Basingstoke,
Hants,
RG22 4PP

or they can be submitted via:
UK.AC.RUTHERFORD.STARLINK.ASTROPHYSICS
FAX to (0256) 471074

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PHOTOGRAPHIC COMET SEEKING **M.J. Hendrie**

I photographed my first comet on 1952 Jan 16 with a Government surplus f/5.6 aeroplane lens of 350mm (14 inches) focal length on a very primitive home-made equatorial with only slow motions. That was comet P/Schaumasse then about 6 mag in the constellation Lynx. In those days I used to guide for an hour or so using only rudimentary slow-motions but later I built a heavier equatorial for a 150mm (6 inch) reflector and had the luxury of a drive in RA driven by an old electric gramophone motor through a tangent arm and screw.

About 1960 I borrowed from the BAA a 125mm (5 inch) refractor by Newton of Fleet Street, London built in 1880. This was of long focal length, about f/17, and mounted on a cast iron German equatorial and driven by a Cooke weight powered clock. Also about this time I started testing a rather faster lens covering a wider field than the f/5.6, a Wray f/4.5 wide angle of 300mm (12 inches) focal length. This was built into a box camera made to take whole plates 163 x 212mm (6.5 x 8.5 in) covering 30 x 40 degrees at each exposure.

The camera was therefore about 500mm long by 300mm square, too heavy to mount anywhere but near the point of balance, but to mount it near the declination axis would have meant offsetting it a great deal in order to avoid photographing the end of the refractor. The best solution seemed to be to revert to the 150mm f/8 reflector, mounting the f/4.5 Wray above the reflector and the f/5.6 to balance it below. The telescope was then housed in a run-off wooden building 3.6 metres (12 ft) square with walls 1.5 metres high. The roof had a door in the south gable and ran off on rails towards the north. A 3 metre diameter dome would have needed a 1.8 metre wide slit with this wide-angle lens, not very practical.

The Wray lens was designed for wide-angle aerial photography and would have been used with 225mm (9 inch) wide panchromatic roll film, possibly with a yellow filter for haze cutting. The clear aperture at the stop of the lens is only about 67mm (2.7 inches) but the front element is strongly curved and nearly 110mm (4.5 inches) in diameter, while the rear element is large too. This gives a wide field with full illumination.

I tried the lens out using HP3 plates and found that with careful focussing and squaring on it gave good, small, hard star images. Although the brighter stars off the axis were not circular but more diamond shaped they were very sharp. Bright stars away from the axis produced images with tangential wings but the central part of the image was very sharp and contained most of the light.

I had sought the views of a number of comet observers on photographic comet seeking, including some professionals, and received the more or less pessimistic view that with small scale photography the problem of spurious images would be so great as to make the method ineffective in practice. Having used a variety of lenses, including portrait lenses and Aero Ektars, I was well aware of the difficulties and was of much the same opinion myself, but I believed that it might be worth experimenting further.

About this time Dr. Marsden suggested that I use the lens to search for the lost comet P/Temple-Tuttle 1866 1. This was a very long shot, the chances of finding a new comet were probably greater, but it was worth trying; one could find new comets at the same time! In 1962 the position of the comet in its orbit was so ill-defined that the year of perihelion passage was uncertain and the plan was to search along the tracks on the sky for a range of perihelion dates where the comet would probably be about the date of observation. Exposures made over 1962 to 1965 were unsuccessful (the comet was eventually recovered by M.J. Bester at the Boyden Observatory close to the position predicted by Schubart after linking the observations of 1366, 1699 and 1866. The comet passed perihelion on 1965 Apl 30. It was 16 mag at recovery, much fainter than expected and well below the limit of the Wray lens.) Some further search plates were taken in 1966/1967 when this lens made way temporarily for a 100mm aperture Cooke f/4.5, with a narrower field but able to reach fainter comets. It could also be mounted on the 125mm refractor.

This gives the background to my experiments which failed to find any comets that were bright enough for this lens, but did not miss any either so far as we know. It did I believe teach me quite a lot about the pros and cons of photographic comet seeking and the ways of overcoming the difficulties. I may well have another attempt when time allows because as with visual comet seeking, given the right tools it is, in the end, a matter of hard work and luck. The rest of this note describes in more detail how I went about it and what I learnt as a result in the hope that it may be of some use to others who may wish to try their luck in this direction. The methods described here are those finally adopted, which I consider to be the best with the equipment available, and which I should use again.

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The amateur astronomer, and no doubt many a professional, has to make use of such equipment as comes to hand and this often falls far short of the ideal requirements. Clearly the sole use of a moderate size Schmidt for comet seeking would be preferable to the Wray lens, but a small Schmidt of about the same focal length might lose in the smaller area of sky covered more than would be gained by the higher speed, because of the greater number of exposures and film changes. The question of sky covered in a given observing time and faintness of comets recorded is second only (and not entirely independent of) the most important requirement which is to recognise any comets photographed as comet-like objects.

Having previously used several different f/2.5 and f/3 portrait lenses of nineteenth century vintage, all of which gave good star images within 3 degrees of the optical axis but larger, softer images often oval or drawing-pin shaped away from the axis I knew that none would cover even a quarter plate (81 x 106mm) although because of their simple construction they were very fast. A 175mm (7 inch) focal length Kodak Aero Ektar gave soft images at full aperture (f/2.5) even on the axis and would have had to be stopped down at least to f/5.6 to have given reasonable images for this purpose. Experiments with 300mm (12 inch) Ektars showed that they were unsuitable for the same reason, which was a pity because a 125mm aperture camera lens would have been very useful for comet photography.

The 300mm Wray on the other hand gave small hard images near the axis and while the images away from the axis were increasingly deformed they all had a small sharp centre containing most of the light. At 15 degrees off the axis the images of bright stars looked rather like sycamore seeds, but the wings were not visible on faint stars, and it is the faint stars that are the problem. The star images near the optical axis were no larger than 0.04mm, in quite good agreement with Whipple and Rubenstein's experimental value of 0.03mm for a system of about this focal length and f/ratio.

Small, sharp star images are important for several reasons, the light is focussed on to a smaller area of emulsion and fainter stars are recorded, or the same stars in a shorter exposure time; more doubles, clusters etc. are resolved; images of non-stellar objects stand out more clearly from the stars, and comet-like objects of smaller diameter can be identified by inspection. Given good optics, adjustment and guiding, the size of star images increases only slowly with focal length for small cameras. This leads on to the next point of plate scale.

Plate scale is directly proportional to focal length and for a 300mm lens or mirror is about 1.9 degrees per cm or 1 arcmin is equal to 0.09mm approximately. The smallest star images are about 0.04mm or about 25 arcsec across, while the same images with a 50mm focal length lens would be about the same linear size but about five times the angular size, say about 2 arcmin.

Trials with an f/2.8 Tessar of 80mm focal length showed that 9 mag comets could be photographed in a few minutes and identified, but the images were small and difficult to pick out even when one knew where to look as a comet of diameter 2 arcmin was little larger than the fainter star images. There is, of course, more photograph not covered with star images with the larger scale and less chance that the comet suspect will be involved with the images of stars or other objects.

Returning to the search for new comets, clearly it would be possible to search with a short focus lens for comets of up to 9 mag but it would hardly be worthwhile to try to compete directly with visual observers for comets in the brightness range up to 10 mag. The photographic method is more cumbersome and expensive than the visual and if it is to be worthwhile its advantages must be exploited. Very few comets are discovered visually that are fainter than 10/10.5 mag at discovery; I believe that none are discovered photographically as a result of a deliberate search for new comets only. Thus the photographer should aim to go fainter than $10\frac{1}{2}$ mag; the fainter the better, but how faint will depend on the equipment available. In the end it is a trade-off against aperture (faintness reached) and field (sky searched in the time available). The 300mm aperture paraboloid is too restricted in sky coverage, and the 35mm format camera by not being able to reach faint comets and the smallness of the cometary image. Somewhere in between one has to reach a compromise.

I believe that the minimum focal length is 250mm (10 inches), minimum speed f/4.5 and minimum field 20 x 20 degrees. But a faster system could operate with a smaller field as exposures would be shorter and if you can afford a longer focal length and the time to take more exposures, then you can reach fainter comets. The 48 inch Schmidt is perhaps the ultimate comet seeker, but most of us have to make do with somet ng less expensive.

To keep exposures reasonably short the fastest plates were used. In this case, in the search for P/Temple-Tuttle, it was expected that the comet if found would be within 1 and 2 AU from the Sun. At this distance most periodic comets show fairly strong emission bands of C_2 at 4737 Å and 5165 Å in the green part of the spectrum. Although the CN band at 3883 Å is often stronger, the Wray lens was known to absorb rather heavily at shorter wavelengths, so Kodak Oa-J plates were used. These recorded 12 mag galaxies in 15 minutes. Exposures were usually of 40 or 30 minutes. As only a single camera lens was available, double exposures were made on each plate, the second being half that of the first, i.e. 30 minutes followed by 15 minutes. The telescope was moved 3 arcmin in RA between exposures. In practice it was found that the shorter exposure was long enough to confirm any suspect picked up with the longer exposure. Any object without a twin was a fault. The shorter exposures were always made to the west of the brighter one so that plates could be compared more easily.

It is impractical to search very near the horizon because of increasing absorption, fogging and rotation of field due to differential refraction. Exposures were therefore never started or ended within about 2 hours in hour angle from the horizon.

Plates must be examined as soon after exposure as possible in case any suspects are found. To eliminate most suspects reference plates were taken on very good nights with longer exposures on the same plate centres. Bright stars were used to guide on to improve accuracy and to minimise the chance of picking up the wrong star. They were all brighter than about 4 mag. These plates with double exposures were all checked very carefully for spurious objects and comet-like objects all of which were checked against the catalogues where there was any doubt about the identity of the object.

Finding the celestial co-ordinates of objects on small scale plates is very time consuming. To overcome this difficulty two identical transparent grids were made from developed unexposed plates ruled with a fine point to give 1200 roughly 1 degree squares. These were numbered along the edges, and objects were recorded giving these co-ordinates.

Plates were examined by placing side by side in front of a diffuse screen the reference plate of the area and the search plate, each covered by its identical grid with the same stars in each corresponding numbered square.

Plates and grids were clamped together with small bulldog clips to obtain exact register. A powerful magnifier or eyepiece was used to examine in turn each square, all 1200 of them. This could take 4 to 8 hours to do properly in a difficult area; near the denser parts of the Milky Way there could be fifty pairs of stars in a square. It was found to be worthwhile to have a quick look first in case there were any bright suspects, but in the end the only way is to go over every square.

Conclusions

1. To be worthwhile a wide angle camera of 250mm focal length or more and f/4.5 or faster, covering at least 400 square degrees per hour is needed. The Wray covered 1200 square degrees per hour of observation.

2. Star images must be sharp and small over a wide field, requiring a well adjusted and suitable system, accurate polar adjustment, good guiding and photography away from the horizon and pole.

3. To reach 12 mag or fainter in a reasonable time suitable emulsions are desirable, with careful processing to yield comparable plates.

4. Plates should be taken on standard centres, reference plates being used to check search plates. Searching needs to be done soon after exposure if any comets are to be recovered. If plate checking is not done really thoroughly it is probably not worth bothering at all because with any system an amateur is likely to be using the margin between success and failure is very small anyway.

5. Areas bordering the Milky Way are difficult because of the crowding together of stars but on the other hand areas rich in galaxies are much easier than for visual observers because the images are quickly eliminated by comparison with the reference plates. The Wray showed the shapes of 12 mag galaxies so that spirals at least could be eliminated at once.

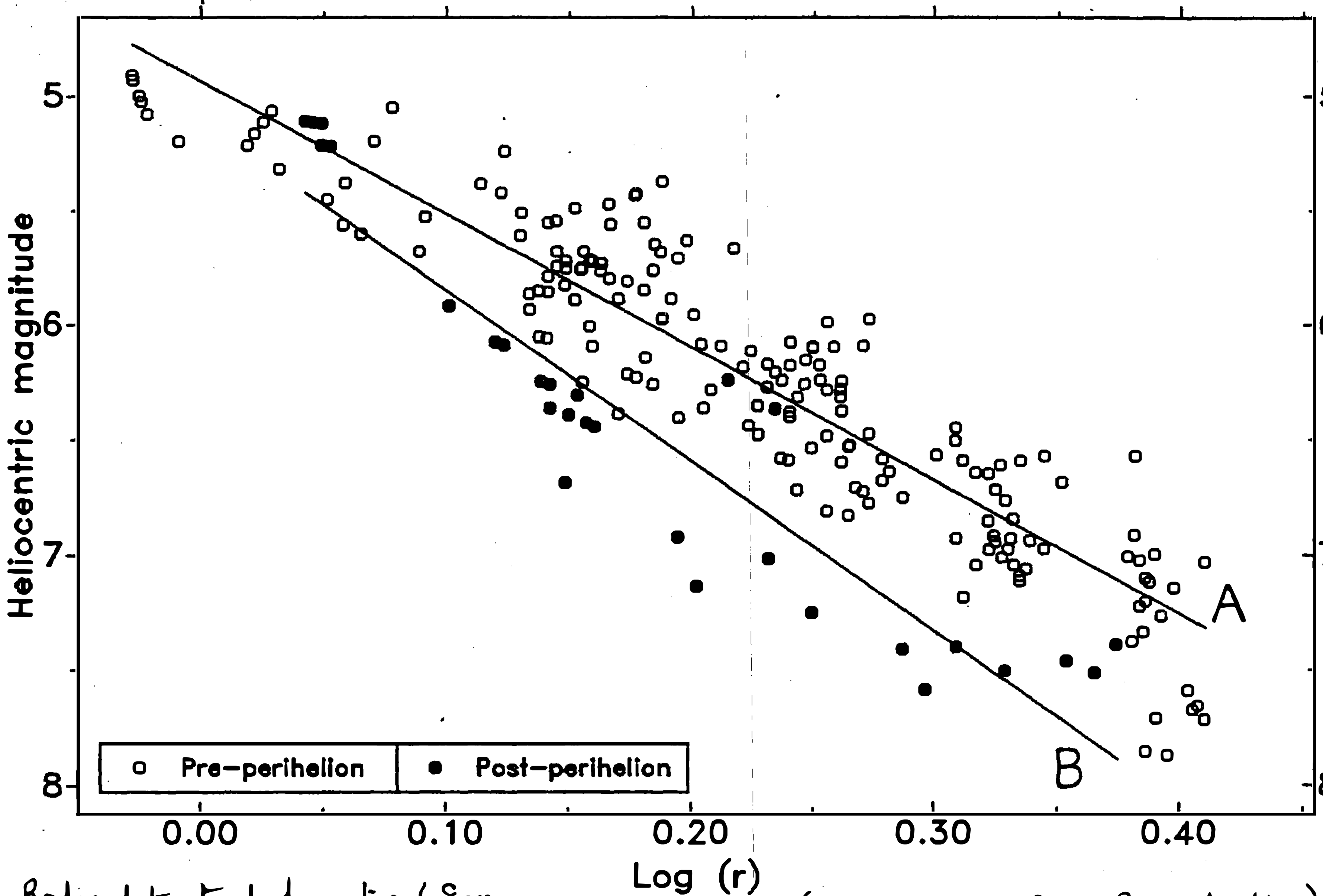
6. Photographic comet seeking can be complementary to visual work if one concentrates on fainter comets. I would not recommend photography over visual comet seeking because of its added complexity, the time lag between finding a suspect and being able to check it out and the greater cost. But it is feasible with fairly small equipment if enough attention is paid to exploiting the advantages of the method rather than competing directly with most visual comet searchers. Whether it is quicker or better than visual searching with a larger instrument away from the twilight areas is probably a matter for the individual, some may feel they can examine plates but are not very likely to see a faint comet in the telescope.

7. However, anything that increases the number of comets discovered or discovers them earlier is worthwhile. Photography carefully applied could do that.

MICHAEL J. HENDRIE

BASED ON 181 observations (Pre-perihelion) 29 (post)

Comet Levy 1990c



Reduced to standard aperture 6.8cm.

LINE A (Pre-perihelion $M = 4.93 \pm 0.04 + 5 \log(\text{Earth}) + 5.80 \pm 0.17 \log(\text{Sun})$

LINE B (Post-p) $M = 5.10 \pm 0.12 + 5 \log(\text{Earth}) + 7.42 \pm 0.55 \log(\text{Sun})$

(Submitted by Peter Biltwhistle)

GUY M HURST
BAA COMET SECTION Assistant Director.

PROSPECTS FOR 1992

Scope of these Notes All comets known to be at perihelion in 1992 are included irrespective of brightness. Of the comets with earlier perihelia, only those of possible observational interest to us are mentioned. The general limit of our magnitude range is taken to be 12 - 14, according to instrumentation and circumstances. The viewpoint is that of northern hemisphere observers in latitudes 30°- 60°.

General Most of the comets inherited from 1991 will be on the way out and fading, but two are quite promising: Helin-Lawrence, 1991l, which will be a southern object fairly bright at perihelion, and Shoemaker-Levy, 1991a1, which promises to be quite bright in June-July, well placed in the northern sky. However, long-range forecasts of the brightness of long-period comets are notoriously risky.
The returning short-period comets are a pretty dismal lot, either through intrinsic faintness or unfavourable circumstances; even P/Chernykh, which was doing quite nicely, has fallen apart.

P/Schwassmann-Wachmann 1 During the first quarter of the year this annual comet will move slowly through the northeastern part of Aries until it enters the twilight zone, from which it emerges in late July. It will then retrograde through southern Auriga till the end of the year, when it will be well-placed and at its quiescent brightest. It has been less active in 1991, the only reported outbursts being in August and September when it reached its disturbed maximum of 12th mag. The only way to be sure of not missing these unpredictable surges is to keep the comet under regular surveillance, taking a look at the ephemeris position whenever the opportunity arises.

P/Levy, 1991q Though not rivalling its long-period namesake 1990c, this comet has been reasonably bright at 8½ mag. in June-July, but fading now and starting 1992 nearer 14th, still reluctant to leave the morning sky, but at least getting into northeastern Cancer. Its period of about 50 years means that many of us will never see it again.

P/Hartley 2, 1991t Thought at first to be a new discovery by Kryachko, the object was identified by Nakano as P/Hartley 2, nearly six days early and well off the ephemeris. Having reached 8th magnitude in the autumn, though obstinately keeping in the early morning sky, it has since faded slowly, but will be with us for a while in 1992, fading from 12th mag. as it moves through Sextans.

P/Wirtanen, 1991s Another of the little group of comets infesting the morning sky, this object reached 10th magnitude in late September, thus exceeding expectations and suggesting that we should revise our ideas about its normal brightness, remembering its good performance in 1986. At the beginning of 1992 it will be in mid-Virgo, 12th magnitude and fading.

P/Shoemaker-Levy 6, 1991b1 The multiplicity of comets bearing the names of these indefatigable discoverers makes it essential to refer to the numerical designations in order to avoid confusion. This one, found on 1991 Nov.7 in Pisces, was 13th mag. and had a 1' tail. It has since been reported visually at 10th mag., indicating a post-perihelion flare. This may explain why the comet was not discovered early in October, when it made a close approach to the Earth. Rapid fading will bring the magnitude down to 14 - 15 at the beginning of 1992, when the comet will be in Triangulum, moving on into Andromeda.

P/Faye, 1991n Making one of its most favourable apparitions, this comet has kept more sociable hours and has been very widely observed. At 10th magnitude in October, it had a nice little tail, visually about 20' but more than 1° reported by CCD observers. Well placed in Cetus at the start of 1992, it moves slowly East and North, fading from 12th to 14th mag. by the end of March.

Shoemaker-Levy, 1991d Discovered on 1991 Jan.22, this rather distant object with high inclination just scrapes into a 1991 perihelion.From its original 15th mag. it has brightened slowly to its present 12, and will start 1992 at about 11½.It fades slowly to 14th magnitude by the end of September, as it moves from Hercules into Cygnus and down the Milky Way into Sagitta.

Helin-Lawrence, 1991l First of the comets known to be at perihelion in 1992, this object, discovered in 1991 March, has been observed at 13th-14th mag. during April, but brightens rapidly during the latter part of 1991 and starts the New Year at 8½.It will, however, be a southern hemisphere object, about 10° from the south celestial pole, moving rapidly northwards towards the Sun, passing about 25° south of it in April.It fades slowly, and when in June it reaches northern declination in Cetus, it will still be 12th magnitude, fading to 14th by mid-Nov.

P/Chernykh, 1991o Making its first return since discovery in 1978, this comet was recovered in 1991 June, with the indicated T 2.4 days early. All went well for a while, and 12th magnitude was reached at the end of August.Then disaster struck and the comet was reported on Sept.15 - 16 as having split into two components, both of which were very faint - Mould R magnitudes of 16.1 & 19.1 .Little has been reported since then, except that the components have separated further, and that the fainter one is unlikely to survive perihelion.

Helin-Alu, 1991r This is a very distant object, with q not far inside the orbit of Jupiter, and it is correspondingly faint.Even at its closes to us at the end of June it will only be 15th - 16th magnitude,though not too badly placed in Sagitta, but the Milky Way together with solsticial twilight will make things more difficult.

P/Kowal 1, 1991i Discovered in 1977, this comet has an interesting orbit with q=4.7 A.U. and e= 0.23, the period being 15 years.The prediction for its first return was uncertain by two weeks either way, but when the comet was recovered by Scotti on 1991 Feb.21, it was 3° off the ephemeris and the indicated correction to T was -94 days!
The comet will be of mainly professional interest,as it is unlikely to be brighter than 17½ mag. when at its best in April 1992, though well placed near Spica.
Future development of the orbit takes the form of a progressive expansion of e & a, q not changing much, though the angular elements are drastically altered.

P/Giacobini-Zinner, 1991m This comet has two claims to fame: it is the parent of the Giacobinid (October Draconid) meteor stream, which gave major displays in 1933 & 1946, and it was the first comet to be encountered by a spacecraft - the ICE (ISEE) satellite in 1985.
Unfortunately this is one of the least favourable apparitions possible; in similar circumstances the comet was completely missed in 1953, but happily it was recovered on 1991 Feb.16 at 22nd magnitude.Perihelion occurs in 1992 at the opposite side of the Sun from the Earth, and the elongation is too small for observation until August, when the magnitude will be only 15, fading to 16½ by the end of the year, while the comet moves southwards through Hydra.
Prospects for a meteor display are equally gloomy - the Earth will be at the descending node 173 days after the comet.

McNaught-Russell, 1991v This is a distant and faint object, discovered at Siding Spring on 1991 Aug.3 . It remains in the southern sky all the year, brightening slightly from 16½ mag. to 15½ in May, and sinking back to 16½ in December.

P/Tsuchinshan 2 This is one of a pair of comets discovered at Purple Mountain Observatory, Nanking, in 1965. Never very bright, it will be around 15th magnitude during the first half of the year, fading to 17th by the end of 1992. Throughout the year it moves steadily eastwards and southwards, beginning in Aries and ending in southern Hydra.
The other member of the pair, Tsuchinshan 1, 1991c1, was recovered on 1991 Nov.8 at mag.17 - 18. It may reach 14th mag. in 1991 December, moving southeastwards in Virgo and fading.

P/Grigg-Skjellerup This intrinsically faint comet has an interesting history; lost for three revolutions after its 1902 discovery, it was rediscovered in 1922. Since then it has been well observed, and has been traced back to an 1808 observation made by Pons.
The orbit is somewhat chaotic owing to encounters with Jupiter, the one in 1820 reversing the nodes. A slow increase of q has resulted in the present situation in which the orbit almost grazes that of the Earth at the node, the separation being only 0.01 AU and the line of apsides being only 0.7° distant. Two consequences follow from this configuration: the comet could make a very close approach to the Earth, when it would be about 3rd magnitude and moving across the sky faster then IRAS-Araki-Alcock did in 1983. The second consequence is the possibility of a meteor shower, and in 1977 a respectable 40 meteors per hour were seen coming from the expected radiant in Puppis.
The 1992 apparition is quite unfavourable; during the year the comet moves from Eridanus through Virgo and into Aquila, keeping close to the celestial equator. It reaches its brightest in late July, when it will be 13th - 14th magnitude, low in the western sky.
Finally, P/Grigg-Skjellerup is scheduled to join the select band of comets investigated by spacecraft, for Giotto is being directed to an encounter on 1992 July 10. In this connection an appeal for prompt and precise astrometry has been made, and a special catalogue of reference stars produced.

Shoemaker-Levy, 1991a1 This is one of the brighter prospects for 1992. It is always difficult to judge from the early photographic results what the eventual visual brightness will be, but using the only data available the prognosis is 6 - 7 mag. at perihelion in July. The comet will be well placed in the evening sky, moving rapidly from Cassiopia through Camelopardalis into Ursa Major, passing about 13°South of Polaris. By September it will have faded to 9 -10 mag., well down in Corvus and too close to the Sun for observation.

P/Smirnova-Chernykh The small eccentricity (0.147) of the orbit of this faint comet enables it to be observed at aphelion, and it is not given a provisional designation. Close encounters with Jupiter in 1955 and 1963 changed the orbit drastically and led to the subsequent discovery in 1975. Nakano later showed the comet to be identical to an object previously designated as a minor planet (1967EU). Never bright at the best of times, the comet remains at 20 - 21st magnitude throughout the year.
Next century, in 2019 and again in 2073-2080, the comet will experience temporary satellite capture by Jupiter.

P/Shoemaker 2 Intrinsically this is a very faint comet, and although this apparition is only moderately unfavourable, the magnitude is unlikely to be better than 15½. In July and August the comet will move from Cetus into Taurus, in the morning sky.
Apart from a slow increase of inclination, the orbit remains stable in other respects.

P/DuToit-Hartley Discovered in 1945, this comet was lost for the next six revolutions until rediscovered in 1982, when it was found to have split into two components. Only the fainter one survived, and was recovered in 1986 at 19th mag. The present apparition is unfavourable, the comet being extremely faint during the first five months of the year, and at too small elongation for observation during the remainder.

P/Wolf During its discovery apparition in 1884 this comet was fairly bright, magnitudes from 6 to 8 being recorded; in 1891 the magnitude again reached 8. Since then a rapid progressive decline has occurred, and since 1925 nothing better than 18th magnitude has been reported. Close approaches to Jupiter are responsible for these changing fortunes. In 1875 q was reduced from 2.7 AU to 1.6, and in 1922 q was restored to 2.4 AU. Future years will see a steady increase of q, probably removing the comet from observational range. The present apparition offers no better than 17th magnitude in Sept. - Oct., when the comet will be well placed in Pisces.

P/Daniel This is another comet that has fallen on hard times after a promising start. An approach to Jupiter in 1901 reduced q from 1.52 to 1.36 AU, and the very favourable apparition of 1909 led to discovery as a 9th magnitude object. The next three perihelia were unfavourable and the comet was not recovered until 1937, by which time another joust with Jupiter had increased q to 1.54 AUand at that and the following apparition it was seen at 12 - 13th mag. All subsequent returns have been poorly timed and brightness has been in the 15 - 20 mag. range. The present appearance is no exception, with maximum brightness around 17 - 18 mag. when in late summer the comet will be in the early morning sky in Gemini.
A further encounter with Jupiter will make things worse and possibly lead to loss of the comet, as the outward trend of q will continue from 1995 onwards.

P/Schuster Discovered in 1977 at La Silla, the cometary nature of this object was in doubt until it developed a 1' tail - in fact it had been recorded earlier as an asteroid. Circumstances were fairly good and it reached 15½ magnitude. The following return was poor and the comet was missed, but this time is similar to 1977 and16th mag. may be reached in the autumn when it will be in Gemini in the morning sky.
Future orbital changes will be slow and of a minor nature.

P/Giclas Discovered at Lowell in 1978, this comet reached 15½ magnitude at its brightest. At the slightly less favourable apparition of 1985, visual magnitudes of 13½ were recorded. This is another instance of the disparity between photographic and visual magnitudes, which often amounts to two or more magnitudes, even though the former are given as 'total' rather than 'nuclear' (m_1 rather than m_2).
The present return is a little less favourable than that of 1985, but we may hope for 14th mag. when the comet is in Taurus in late summer. The orbit is fairly stable until 2300 AD, when a tangle with Jupiter will shift it right outside that of the planet.

P/Singer-Brewster A close approach to Jupiter in 1976 was probably responsible for the discovery of this comet a decade later, but even so it is still a faint and distant object. Given this year's unfavourable return there seems little prospect of the comet being brighter than 18th magnitude, and as such it will be of little concern to users of modest instruments.

P/Swift-Tuttle,1862III and Kegler (or Kögler), 1737II

P/Swift-Tuttle was the first comet to be shown to be associated with a meteor shower - the Perseids.It was a fine object in its own right, second magnitude with a 30° tail.It also exhibited an anti-tail and considerable jet activity.The indicated orbital period was 120 years, which would have resulted in a 1982 return.The strong Perseid shower of 1980 raised speculation that the parent comet was not far off, but later displays were back to normal and the comet was not recovered.
It has long been thought that a comet observed from Peking by Kegler in 1737 might have been the previous apparition of that of 1862.Only eight observations over a seven-day arc were obtained, and treatment of them by Hind in 1874 and Marsden in 1973 yielded elements roughly similar to those of the well-observed 1862 object, with the notable exception of the inclinations, which were 63° and 113° respectively, corresponding to direct and retrograde motion.However, ignoring this slight difference, the general position was consistent with the proposed identity.
Assuming that the identification is correct leads to a prediction of T = 1992 November 26, give or take a couple of months. The orbit of P/Swift-Tuttle is remarkably stable gravitationally, and deviation from formal prediction would be due to non-gravitational forces, which are probably quite strong in this case owing to the active nature of the comet.
If the comet does indeed return to perihelion in 1992/3, all will hinge on the date, for the uncertainty encompasses all scenarios from the spectacular to the disappointing.We can only 'wait and see' (or wait and not see),aa recovery will entail systematic searching with wide-field instruments along the predicted track.
Although controversy has attended the discussion of the 1991 return of the Perseids, two facts emerge as beyond reasonable doubt: the maximum was stronger than normal, and the proportion of very bright meteors was unusually high.Whether or not this is related to an imminent return of the parent comet, only time will tell.

Elements from IAUC 5330, 1991 August 28.

T = 1992 Nov.25.85, ω=153°.05, Ω = 138°.74, i = 113°.45, q = 0.9582 AU, e = 0.9633.

P/Gale This comet has been living dangerously for the past two centuries making numerous encounters not only with Jupiter but with Saturn too, that of 1798 with the latter being unique at a distance of only 0.17 AU, while even closer approaches to Jupiter occurred in 1801 & 1917. In spite of all this, only the angular elements have been strongly affected q and e remaining fairly stable.The apparitions of 1927 and 1938 were the only favourable ones this century and the comet has not been seen since the latter date.At discovery the magnitude was 8, and in 1938 a brief outburst was noted at 8½, the comet being more diffuse than previously, but all subsequent attempts to recover the comet have failed There is little chance of success this time, as the circumstances could hardly be worse, perihelion occurring close to superior conjunction. With only 18th magnitude indicated, this one will be of purely academic interest to us.

Two of the 1993 comets should be available to us in the latter part of 1992.

P/Ciffréo This was discovered in 1985 not far from P/Halley, and might have received more attention had we not been preoccupied with the latter. The present return is moderately favourable but the comet never gets closer than 1 AU to us and will remain in the 13 - 14 magnitude range from 1992 September until 1993 February, moving northeast from near Delta Aquarii into Aries.

P/Schaumasse Some of us will remember the optimum apparition of 1952 when this comet attained naked-eye brightness at 5 - 6th magnitude. Not so good this time, but from 1992 September until 1993 March it should brighten from 14th to 8½ mag. as it moves slowly back and forth near the Hyades.

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H.B.Ridley,
Eastfield Observatory.
1991, November 30

Comets in 1992

Comet	Prov. desig.	T	Brightest Mag.	Brightest Month	Brightest Elong.	Moon New	Moon Full
P/Schwassmann-Wachmann 1	-	1989 Oct.26.7	18(12)	Dec.	170N	Jan. 4	
P/Levy	1991q	1991 July 8.2	14	Jan.	165W		Jan.19
P/Tsuchinshan 1	1991c1	Aug.30.5	14-15	Jan.	60W	Feb. 3	
P/Hartley 2	1991t	Sept.11.7	11-12	Jan.	130W		Feb.18
P/Wirtanen	1991s	Sept.20.7	12-13	Jan.	95W	Mar. 4	
P/Shoemaker-Levy 6	1991b1	Oct.13.9	14-15	Jan.	130E		Mar.18
P/Faye	1991n	Nov.16.2	11	Jan.	90E	Apr. 3	
Shoemaker-Levy	1991d	Dec.31.2	11-12	Jan.	70N		Apr.17
Helin-Lawrence	1991l	1992 Jan.20.3	8-9	Jan.	60SE	May 2	
P/Chernykh	1991o	Jan.25.4	?	Jan.	70E		May 16
Helin-Alu	1991r	Feb.20.1	15-16	June	130W	June 1	
P/Kowal 1	1991i	Mar.10.4	17-18	Apr.	180		June15
P/Giacobini-Zinner	1991m	Apr.13.2	14-15	Aug.	35W	June30	
McNaught-Russell	1991v	May 3.3	15-16	May	75S		July14
P/Tsuchinshan 2		May 20.1	14-15	Jan.	115E	July29	
P/Grigg-Skjellerup		July22.1	13-14	July	45E		Aug.13
Shoemaker-Levy	1991a1	July23.8	6-7	July	50E	Aug.28	
P/Smirnova-Chernykh	-	Aug. 5.9	20	Feb.	165E		Sep.12
P/Shoemaker 2		Aug. 6.9	15-16	Aug.	75W	Sep.26	
P/DuToit-Hartley		Aug.27.6	18	Sep.	25E		Oct.11
P/Wolf		Aug.28.1	16-17	Oct.	180	Oct.25	
P/Daniel		Sep. 1.7	17-18	Oct.	65W		Nov.10
P/Schuster		Sep. 6.4	16	Oct.	95W	Nov.24	
P/Giclas		Sep.13.1	14	Nov.	160W		Dec. 9
P/Singer-Brewster		Oct.28.2	18	Apr.	75E	Dec.24	
P/Swift-Tuttle (Kegler?)		Nov.26 ?	?	?	?		
P/Gale		Dec.18.2	18	Aug.	35E		
P/Ciffréo		1993 Jan.22.5	13	Nov.	120E		
P/Schaumasse		Mar. 4.1	10	Dec.	160E ($8\frac{1}{2}$ in1993Feb.)		

Elongations are for approx. mid-month, and are rounded to nearest 5°.

Short-Period Comets at Perihelion in 1993

P/Comet	T 1993	q A.U.	P yrs	Previous Apparitions N	First	Last
Ciffréo	Jan.22.48	1.71	7.23	1	1985XVI	-
Howell	Feb.26.10	1.41	5.58	2	1981X	1987VI
Schaumasse	Mar. 4.10	1.20	8.22	8	1911VII	1984XXII
Forbes	Mar.14.63	1.45	6.13	7	1929II	1987I
Holmes	Apr.10.75	2.18	7.09	7	1892III	1986V
Väisälä 1	Apr.29.18	1.78	10.78	5	1939IV	1982V
Lovas 2	June 2.40	1.46	6.76	1	1986XIII	-
Wiseman-Skiff	June 4.39	1.51	6.53	1	1986XV	-
Slaughter-Burnham	June22.43	2.54	11.59	3	1958VI	1981XVIII
Urata-Niijima	July13.33	1.46	6.64	1	1986XVI	-
Ashbrook-Jackson	July14.05	2.32	7.49	6	1948IX	1986II
Gehrels 3	July25.42	3.43	8.11	2	1977VII	1985IV
Neujmin 3	Nov.13.04	2.00	10.63	3	1929III	1972IV
Shajn-Shaldach	Nov.15.98	2.34	7.49	4	1949VI	1986X
West-Kohoutek-Ikemura	Dec.25.31	1.58	6.41	3	1975IV	1987XV

N = Number of previously observed apparitions.

Complete precise orbital elements for any of these comets are available on request.

COMET NEWS FROM THE IAUC's 5249-5426
****
DISCOVERIES,RECOVERIES,ELEMENTS ETC.

1991e P/SHOEMAKER-LEVY 3

Improved orbital elements from 21 observations Feb.7 - Apr.15

T=1990 Dec.26.7758	Peri.=185.2002
e=0.248508	Node.=302.9169 (1950.0)
q=2.814337 AU	Incl.= 4.9820
a=3.744999 AU	n =0.1359961
p=7.247 years	

IAUC 5249

1991f P/SHOEMAKER-LEVY 4
Orbital elements from MPC 18081:

T=1990 July 14.5431	Peri.=302.2295
e=0.422300	Node =151.4066 (1950.0)
q=2.017506 AU	Incl.=8.4785
a=3.492310 AU	n =0.1510202
p=6.526 years	

IAUC 5260

1991n P/COMET FAYE
On Oct 10 D.Rabinowitz, using the Spacewatch telescope at Kitt Peak, detected a very diffuse band of light, some 1'-2' wide and 2 deg long, extending beyond the field of view of the scan. J.Scotti confirmed the band with the same telescope the following night and noted that band could be traced to the head of P/Faye, e for > 10 deg; the band had a uniform width of about 2'. The earth crossed the plane of the comet's orbit on Oct 13.3 ET.

IAUC 5366

1991o P/CHERNYKH
J.V.Scotti,Lunar and Planetary Laboratory,reports the recovery of this comet on Spacewatch images by himself and D.Rabinowitz.On June 10.460 there was a coma about 8 minutes across and a faint tail extending more than 8" in pa 252 deg. The indicated correction to the prediction on MPC 14592 (ephemeris on MPC 17841) is delta T= -2.4 days.

Improved orbital elements from 240 observations 1977-1991:
Epoch= 1992 Jan.19.0 ET

T=1992 Jan.25.4417	Peri.=263.1948
e=0.593637	Node =129.7432 (1950.0)
q=2.356269 AU	Incl.=5.0821
a=5.798435 AU	n =0.0705891
p=13.963 years	

IAUC 5285

J.Luu,Harvard Smithsonian Center for Astrophysics; and D.Jewitt,Institute for Astronomy, University of Hawaii, communicate: "We have discovered that P/Chernykh has split. Observations with the 2.4-m telescope of the Michigan-Dartmouth-MIT bservatory on Sept. 15 and 16 show that the secondary nucleus is separated from the primary by 56".6 +/-0".7 in p.a. 71 +/- 1 deg. Both the primary and seconda y objects appear extended. The Mould R magnitudes of the primary and secondary re 16.1 and 19.1, respectively, measured within an 11".7 diameter diaphram. Hei her separation nor the difference in magnitudes changed between nights."

IAUC 5347

Further observations of the splitting of the nucleus (cf. IAUC 5347) have been reported by S. M. Larson (Sept. 7, 9, Oct. 7, 8), J. V. Scotti and T. Gehrels (Sept. 17, Oct. 2, 15, 16, Nov. 5), J. Luu and D. Jewitt (Oct. 4-6), and R. H. McNaught (Oct. 5).

Z. Sekanina, Jet Propulsion Laboratory, California Institute of Technology, reports: "A solution based on 29 positional observations of the two nuclei between Sept. 7 and Nov. 5 indicates that the companion (the fainter nucleus) separated from the primary at 3.3 AU from the sun, on 1991 Apr. 14.7 +/- 4.1 UT. The separation velocity is found to be higher than that for any other split comet: 15.00 +/- 0.93 m/s along the radius vector in the direction of the sun, 0.60 +/- 0.15 m/s in the direction perpendicular to the radius and toward the direction from which the comet has come, and 0.23 +/- 0.03 m/s in the direction of the comet's north orbital pole. The secondary has been subjected to a differential nongravitational deceleration of 189 +/- 17 units of 10E-5 solar attraction and, in the terminology introduced elsewhere for the split comets (Sekanina 1982, in Comets, ed. L. L. Wilkening, Univ. Arizona, p. 251), it represents a minor companion. The solution satisfies the observations with a mean residual of +/- 0".33. The correlation between the deceleration and the endurance that applies to most other split comets suggests that the companion should disappear shortly. The ephemeris shows no major change in the configuration until around perihelion, by which time the probability of the companion's survival is virtually nil."

IAUC 5391

1991p P/SHOEMAKER 1

P.M.Kilmartin, Mount John Observatory,reports that this comet has been recovere by A.C.Gilmore and herself. The images are diffuse, and the last one is very w ak. The indicated correction to the prediction on MPC 13046 (ephemeris on MPC 1 271) is delta T= -0.6 day.

Improved orbital elements from observations 1984-1991:

Epoch = 1991 Dec. 10.0 ET

T=1991 Dec.18.2230	Peri.= 18.7733
e=0.470347	Node = 339.2496 (1950.0)
q=1.985757 AU	Incl.= 26.2367
a=3.749162 AU	n = 0.1357697
p=7.259 years	

IAUC 5286

1991q LEVY

David.H.Levy,Tucson,AZ, reports his discovery of a comet with a 0.41m f/5 refle tor,as given below. The object is spmewhat condensed with a 3' coma and no evid nce of tail.

```
1991 UT            RA (1950) DECL.     m1
June 14.448        1.42.2   +13 32     8
     14.465        1 42.4   +13 34
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IAUC 5291

Orbital computations show that this comet has a revolution period
¦of some 35-60 years and that when perihelion passage is in September a close ap
proach to the earth is possible. S. Nakano and D. W. E. Green have independentl
y suggested identity with comet 1499, but the numberof intervening revolutions i
s uncertain.

```
¦     T = 1991 July 8.185 ET              Peri. =  41.472
¦     e = 0.92728                         Node  = 328.693   1950.0
¦     q = 0.98217 AU                      Incl. =  19.182
¦       a = 13.50559 AU     n = 0.019858      P =  49.63 years
```

IA } 5306

Orbital elements from MPC 18773:

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¦
¦                     Epoch = 1991 July  3.0 ET
¦     T = 1991 July  8.1927 ET            Peri. =  41.4772
¦     e = 0.928814                        Node  = 328.7224  1950.0
¦     q = 0.982515 AU                     Incl. =  19.1845
¦       a = 13.802108 AU    n = 0.0192214     P =  51.276 years
```

IAUC 5375

1991r HELIN-ALU
Eleanor Helin and Jeff Alu report their discovery of a comet on films taken by H
elin,K.Lawrence,P.Rose, and C.Brewer with the 0.46m Schmidt telescope at Palomar
. The object is diffuse with no apparent tail.

```
19?1 UT         RA(1950)     DECL.       m1
Ju?) 13.32257   16 35 54.60 -22 25 54.7  16
     14.32899   16 35 23.58 -22 18 26.4
```

IAUC 5291

Orbital elements from MPC 18773
T=1992 Feb. 20.0741   Peri.= 30.8133
                          Node = 252.9525 (1950.0)
q=4.850069 AU   Incl.= 49.3134

IAUC 5374

1991s P/WIRTANEN
S.Nakano,Sumoto,Japan reports that T.Seki, Geisei, has recovered this comet(m1=
17). The object is diffuse with condensation, and the indicated correction to th
e prediction on MPC 13046 (ephemeris on MPC 18148) is delta T= -0.05 day.

IAUC 5303

1991t P/HARTLEY 2
G. R. Kastel', Institute for Theoret
ical Astronomy, reports the
¦following rough positions of a comet discovered by T. V. Kryachko at

Majdanak. The object was diffuse and condensed with a coma 15′ across.

1991 UT	R.A. (1950)	Decl.	m1
July 9.854	1 01.5	+20 15	11
9.938	1 02.0	+20 05	
10.875	1 06.2	+20 40	11

S. Nakano, Sumoto, Japan, has suggested that this is P/Hartley 2, a correction of delta T = −5.6 days being necessary to his prediction on MPC 13046. As a result, R. E. McCrosky and C.-Y. Shao were able to confirm the comet and its identification with the 1.5-m reflector at Oak Ridge Observatory, as follows:

1991 UT	R.A. (1950)	Decl.
July 12.31995	1 12 48.80	+21 21 05.9
12.32387	1 12 49.88	+21 21 12.4
12.32899	1 12 51.28	+21 21 20.8
12.33093	1 12 51.82	+21 21 23.9

IAUC 5304

Improved orbital elements from MPC 18598:
Epoch = 1991 Sept.21.0 ET

T=1991 Sept.11.6542	Peri.= 174.9337
e=0.719489	Node = 226.0539 (1950.0)
q=0.953285 AU	Incl.= 9.2561
a=3.398382	n = 0.1573243
p=6.265 years.	

IAUC 5324

1991u P/AREND
S.Nakano,Sumoto,Japan reports the T.Seki,Geisei, has recovered this comet (m1=18). The comet is diffuse and somewhat condensed. The indicated correction to the prediction on MPC 13042 (ephemeris is on MPC 18469) is delta T= +0.01 day.

IAUC 5322

1991v McNAUGHT-RUSSELL
R.H.McNaught,Anglo Australian Observatory,reports his discovery of a comet on a 60 minute R exposure by K.S.Russell with the UK Schmidt on Aug 30 Subsequently he also found it on an Aug.3 plate.

Parabolic orbital elements

T=1992 APR.24.445	Peri.= 253.599
	Node = 120.155 (1950.0)
q=3.32276 AU	Incl.= 91.576

IAUC 5333

1991w McNAUGHT-RUSSELL
R.H.McNaught,Anglo Australian Observatory,reports his discovery of another comet (m1=18), this time on an R plate taken by K.S.Russell with the U.K. Schmidt on Sept 3.

IAUC 5335

The following parabolic orbital elements, from nine observations Sept3-8, are rather uncertain, but they suggest this comet may have a near record large perihelion distance:

T=1991 Jan.12.975 Peri.= 154.056
Node = 149.352 (1950.0)
q=7.11258 Incl.= 104.876

IAUC 5339

1991x SPACEWATCH
J.V.Scotti,Lunar and Planetary Laboratory reports the discovery of a comet(m2=21) from observations with the 0.91m Spacewatch telescope on Kitt Peak by T.Gehrels.

IAUC 5341

The following parabolic and elliptical orbits satisfy 15 observations Sept.8-12comparably well.

T=1991 Dec.8.446 ET Peri.= 45.403
Node =162.993 (1950.0)
q=0.52588 AU Incl = 44.626

T=1990 Dec.15.452 Peri.= 85.867
e=0.51223 Node = 152.956 (1950.0)
q=1.53500 AU Incl = 10.188
a=3.14701 AU n = 0.176546
p=5.58 years

IAUC 5343

Computations from 21 observations Sept.8-17 now make it clear that the comet is of short period:

T=1990 Dec.23.115 Peri.= 89.124e=0.48122 Node = 152.240 (1950.0)
q=1.58060 Incl.= 9.523
a= 304677 AU n = 0.185329
p=5.32 years

IAUC 5351

1991y P/McNAUGHT-HUGHES
R.H.McNaught reports his discovery of a comet(m1=16.5) on an R plate taken by S.M..Hughes with the U.K. Schmidt telescope at Siding Spring. The discovery plate showsthe comet as strongly condensed, with a diffuse 2' tail in pa 250 deg.

IAUC 5354

Improved orbital elements from 8 observations Sept.30 - Oct.12:

T=1991 June 16.320 Peri.= 224.450
e=0.40190 Node = 89.333(1950.0)
q=2.12527 Incl.= 7.299
a=3.55335 AU n = 0.147145

p=6.70 years

IAUC 5374

1991z P/SHOEMAKER-LEVY 5

E.Bowell, Lowell Observatory,communicates the following precise positions, measu red by S.J.Bus, of a new comet discovered by C.S.Shoemaker,and D.H.Levy with the 0.46m Schmidt telescope at Palomar. The object is described as condensed.

1991 UT	RA.(1950)	Decl.	m1
Oct.2.30243	0 23 38.25	-7 29 11.2	16
Oct.3.30625	0 22 48.57	-7 25 13.8	

IAUC 5359

The following preliminary orbital elements from five observations Oct.2-6 indica te that this is a short period comet.

T= 1991 Dec. 1.533	Peri.= 0.430
e=0.48700	Node = 30.062(1950.0)
q=1.96464	Incl.= 11.057
a=3.82974 AU	n = 0.131507
p=7.49 years	

IAUC 5361

Improved orbital elements from 14 observations Sept.17-Oct.14

T=1991 Dec.13.2346	Peri.= 6.0372
e=0.529856	Node = 28.9889(1950.0)
q=1.984423 AU	n = 0.1136576
p=8.672 years	

IAUC 5376

1991a1 SHOEMAKER-LEVY

Carolyn S.Shoemaker,Eugene M.Shoemaker and David H.Levy report their discovery o f another comet.

IAUC 5363

Orbital elements from MPC 19258

T=1992 July 23.7558	Peri.= 145.4157
	Node = 48.2948(1950.0)
q=0.829393	Incl.= 113.3739

IAUC 5380

1991b1 P/SHOEMAKER-LEVY 6

C.and E.Shoemaker and D.H.Levy report their discovery, on a 0.46m Schmidt films taken at Palomar,of a fast moving comet. Approximate positions follows:

1991 UT	RA(1950)	Decl.	m1
Nov.7.190	0 07.0	-1 35	13
9.193	0 11.5	+1 50	
10.156	0 14.3	+3 33	

The comet is strongley condensed on the films,with a coma of diameter about 30". On Nov.10.16,there was a tail about 1' long toward the east;at about this same time,Levy estimated m1= 12.7 visually ian 0.15m reflector.

IAUC 5382

Improved orbital elements from 9 observations Nov.3-Dec.4

T=1991 Oct.13.863 Peri.= 333.131
e=0.70631 Node =37.929(1950.0)
q=1.13245 AU Incl.= 16.863
a=3.85588 AU n = 0.130172
p=[illegible]57 years

IAUC 5416

1991c1 P/TSUCHINSHAN 1
S.Nakano,Sumoto,Japan reports the recovery of this comet by T.Seki with the 0.60 m reflector at Geisei. The comet has a tail 30" long in pa 300 deg and is diffuse with central condensation. Seki's observations yield a correction to the prediction on MPC 13057 of delta T about +0.02 day.

IAUC 5383

1991d1 P/SHOEMAKER-LEVY 7
C.and E.Shoemaker and D.H.Levy report their discovery of another comet on films exposed with the 0.46m Schmidt telescope at Palomar. The comet is diffuse with condensation.

IAUC 5389

Orbital elements from 7 observations Nov.13- Dec.5:

T=1991 Oct.27.3096 Peri.= 91.7535
e=0.542469 Node = 312.3191(1950.0)
q=1.628858 AU Incl.= 10.2625
a=3.560102 AU n = 0.1467271
p=6.717 years

IAUC 5397

1991e1 P/TSUCHINSHAN 2
J.Scotti,Lunar and Planetary Laboratory,reports the recovery of this comet(m2=21)on images obtained with the 0.91m Spacewatch telescope by D.Rabinowitz and himself. The comet appears stellar, to the limits of seeing and the position is in close agreement with the prediction on MPC 14593 (ephemeris on MPC 18469).

IAUC 5403

1991f1 P/KOWAL 2
H. Kosai and T. Hirayama, National Astronomical Observatory, Tokyo, report that Masao Ishikawa has discovered a comet, and they provide the following precise positions:

¦
¦ 1991 UT R.A. (1950) Decl. m1 Observer

1991 UT	R.A. (1950)	Decl.	m1	Observer
Dec. 12.70336	8 32 29.59	- 0 30 54.6	14.0	Ishikawa
12.80011	8 32 29.28	- 0 32 48.8		"
13.72775	8 32 42.18	- 0 56 07.9		"
13.76373	8 32 42.29	- 0 57 04.4		"
13.79457	8 32 42.64	- 0 57 48.1		"
15.79330	8 32 59.91	- 1 47 08.1		"
16.72291	8 33 06.03	- 2 09 38.7	14.0	Kushida
16.74930	8 33 06.05	- 2 10 13.9		"
16.79861	8 33 06.41	- 2 11 34.1		"

¦
¦M. Ishikawa (Fukaya, Saitama). 0.16-m hyperboloid astrograph.
¦¦[7m¦¦--More--¦[m¦¦
Tech-Pan film without filter. Image diffuse without condensation.
¦ Measurer S. Hayakawa.
¦Y. Kushida (Yatsugatake South Base Observatory). 0.20-m f/4 hyper-
¦ boloid reflector. Comet images diffuse and difficult to measure,
¦ especially in right ascension.
¦
¦ B. G. Marsden (Harvard-Smithsonian Center for Astrophysics) and
¦T. Kobayashi (Oizumi, Gunma, Japan) have identified the comet with
¦P/Kowal 2 (1979 II), the prediction for which on MPC 13046 requires
¦correction by Delta(T) = -54 days. Marsden provides the following
¦improved orbital elements, which satisfy 16 observations 1979-1991
¦with mean residual 1".2:
¦
¦ Epoch = 1979 Jan. 7.0 ET
¦ T = 1979 Jan. 13.6774 ET Peri. = 189.3294
¦ e = 0.560490 Node = 247.2065 1950.0
¦ q = 1.519722 AU Incl. = 15.8032
¦ a = 3.457766 AU n = 0.1532889 P = 6.430 years
¦
¦ Epoch = 1991 Oct. 31.0 ET
¦ T = 1991 Nov. 4.3598 ET Peri. = 189.5235
¦ e = 0.564287 Node = 247.0738 1950.0
¦¦[7m¦¦--More--¦[m¦¦
q = 1.499650 AU Incl. = 15.8359
¦ a = 3.441834 AU n = 0.1543544 P = 6.385 years

IAUC 5406

1991g1 ZANOTTA-BREWINGTON
Mauro Zanotta and Howard Brewington have independently reported
¦the discovery of a comet. The following observations are available:
¦

1991 UT	R.A. (2000)	Decl.	m1	Observer
Dec. 23.76042	20 44.5	+19 10	9	Zanotta
23.78473	20 45.0	+19 05		"
24.07639	20 45	+19.5		Levy
24.12847	20 47	+18.5	10	Brewington
24.36146	20 46 44.04	+18 53 06.9	10	Kojima
24.36510	20 46 44.71	+18 52 58.7		"
24.37222	20 46 46.24	+18 52 55.6		"
24.37650	20 46 47.18	+18 52 42.2		"

¦
¦M. V. Zanotta (Milan, Italy). 0.15-m reflector. Comet diffuse with
¦ condensation.
¦D. H. Levy (Tucson, AZ). 0.4-m reflector. Only a brief confirmation

of the comet through a gap in the clouds. Position uncertain.
H. J. Brewington (Cloudcroft, NM). 0.4-m reflector. Comet rather diffuse and no longer observable after moonrise.
T. Kojima (YGCO Chiyoda Station). Communicated by S. Nakano.

IAUC 5412

Further precise positions have been reported as follows:

1991 UT	R.A. (2000)	Decl.	Observer
Dec. 26.38681	20 53 53.82	+18 06 31.2	Sugie
26.39306	20 53 55.18	+18 06 22.7	"
26.77569	20 55 18.67	+17 57 11.7	Vagnozzi
26.78993	20 55 21.63	+17 56 50.9	"
28.37589	21 01 13.02	+17 17 35.7	Kobayashi
28.38878	21 01 15.80	+17 17 15.0	"

A. Sugie (Dynic). 0.25-m Schmidt. Communicated by S. Nakano.
A. Vagnozzi (Stroncone). 0.5-m Ritchey-Chretien. Comet very diffuse.
T. Kobayashi (Oizumi). 0.16-m reflector + CCD. Communicated by Nakano.

Parabolic orbital elements from 9 observations Dec. 24-28:

T = 1992 Jan. 31.887 TT   Peri. = 197.719
                                 Node = 255.100   2000.0
q = 0.64426 AU   Incl. = 49.964

IAUC 5419

1991h1 MUELLER

On 1991 Dec. 18 Jean Mueller reported her discovery of a probable comet on a single exposure on Dec. 13 by C. Brewer, D. Mendenhall and herself with the 1.2-m Oschin telescope in the course of Palomar Sky Survey II. The object was diffuse with a possible faint tail to the southwest. The discovery has now been confirmed on a film obtained on Dec. 31 by E. M. Shoemaker, C. S. Shoemaker and D. H. Levy with the 0.46-m Schmidt. The following measurements are all by Mueller:

1991 UT	R.A. (2000)	Decl.	m1	Observer
Dec. 13.48264	9 38 56.16	+42 31 23.9	17.5	Mueller
13.52778	9 38 53.58	+42 31 53.0		"
31.35486	8 58 02.50	+47 38 09.3	16	Shoemaker
31.39444	8 57 52.55	+47 38 58.2		

IAUC 5420

Parabolic orbital elements from 8 observations Dec.13-Jan.2

T=1992 Mar.21.196   Peri.= 307.011
q=0.19871   Node = 288.795 (2000.0)
Incl.=95.524

IAUC 5421

PERIODIC COMET D'ARREST = COMET LA HIRE (1678)

Although the possibility of the identity of P/d'Arrest with a comet observed by La Hire in 1678 was suggested shortly after its 1851 discovery (Valz 1851, Comptes Rend. No. 2, p. 155) and promptly forgotten, this has recently been independently considered by A. Carusi, and G. B. Valsecchi, Istituto Astrofisica Spaziale, Rome, and L. Kresak and M. Kresakova, Slovak Astronomical Institute, Bratislava,and proven to be correct. Although four approaches within 0.5 AU of Jupiter during the 26 revolutions 1678-1851 complicate the linkage,Carusi et al. have ascertained tha t the nongravitational effects on the comet, while relatively large, seem to be extraordinarily stable.
The following orbital elements established by them for the 1678 epoch satisfy three of La Hire's four observations within 0.2 deg: T = 1678 Aug. 23.39 5 ET, Peri. = 159.377, Node = 168.939, Incl. = 2.811 (equinox 1950.0), q = 1.16285 AU, e = 0.67008. A preliminary attempt by G. Sita rski,Center for Space Research, Warsaw, to incorporate the 1678 observations (wi th a difference of some two hours in the times at which they are assumed to have been made; see Pingre 1784, Cometographie 2, 24) directly into a nongravitation al solution covering 3.1 centuries gives (for the epoch 1678 July 3.0) T = 1678 Aug. 23.444 ET, Peri. =159.564, Node = 168.811, i = 2.827 (equinox 1950.0), q = 1.16277 AU, e= 0.67001, A1 = +0.41, A2 = +0.0985. Contrary to a statement in th e recent orbit catalogues, Douwes' (1753, Vervolg Beschr. Staartsterren) parabol ic orbit should have T = 1678 Aug. 28.085. Leverrier's (1848,A.N. 26, 383) solu tion, computed on the incorrect assumption of identity of the 1678 comet with P/ de Vico-Swift, is inconsistent with the observations but can be made to fit with a mean-anomaly adjustment corresponding to T approx. 1678 Aug. 21.5.

IAUC 5283

PERIODIC COMET GRIGG-SKJELLERUP

T. Morley and H. Bohnhardt, European Space Operations Centre, write: "The European Space Agency has approved the mission known as Giotto Extended Mission (GEM) for a spacecraft encounter with P/Grigg-Skjellerup on 1992 July 10. High-quality astrometry of the comet is needed at ESOC to determine the most accurate cometary orbit possible for the flyby. Since there will be no Pathfinder Project' using observations of other cometary missions, the importance of ground-based astrometry for orbit improvement is even higher than during the P/Halley campaign. We would appreciate receiving high-quality astrometric data of P/Grigg-Skjellerup within two days of observation; astrometry will be of highest priority during the two months prior to encounter. We can be reached at ESOC/ECD/OAD, Robert-Bosch-Str. 5, D-6100 Darmstadt, Germany; e-mail TMORLEY@ESOC. BITNET or HBOEHNHA@ESOC.BITNET."

IAUC 5315

PERIODIC COMET SCHWASSMANN-WACHMANN 1

The following visual magnitude estimates indicate that this comet is currently undergoing an outburst: Aug. 6.4 UT, 15 or brighter (R. E. M cCrosky, Oak Ridge Observatory, 1.5-m reflector + CCD); 8.06,11.8: (H. Mikuz, Lj ubljana, Yugoslavia, 0.36-m reflector); 8.41, 12.1 (A. Hale, Las Cruces, NM, 0.4 1-m reflector); 9.08, 12.3 (Mikuz).

A. Cochran, Astronomy Department, University of Texas, informs us that, in view of this outburst, she will be obtaining observations of the comet with the International Ultraviolet Explorer satellite late on Aug. 10 UT. She would app reciate any support observations, especially colors or spectra, that can be obta ined and communicated to her (e-mail anita@astro.as.utexas.edu, telephone 512-471-1471).

IAUC 5321

PERIODIC COMET SCHWASSMANN-WACHMANN 1

H. Mikuz, Ljubljana, Yugoslavia, reports that a 1-min exposure with a 0.19-m f/4 flat field camera (+ CCD) taken on Dec. 11.853 UT shows a starlike central condensation of diameter 40" and a round delicate coma extending out to about 6'.

Total visual magnitude estimates (cf. IAUC 5349, 5396): Dec. 5.21 UT, 12.6 (A. Hale, Las Cruces, NM, 0.41-m reflector); 5.77, 13.4 (S. Garro, Merlette, France, 0.20-m reflector); 5.85, 13.7 (Mikuz, 0.36-m reflector); 6.22, 12.7 (Hale); 6.80, 13.6 (Garro); 9.83, 14.0 (Mikuz); 11.87, 13.2 (Mikuz).

IAUC 5404

PERIODIC COMET SWIFT-TUTTLE (1862 111)

Although it is generally presumed that this comet passed perihelion unobserved around 1981 +/- 2, the possibility that P/Swift-Tuttle was identical with comet 1737 11 Kegler and that it may return in late 1992 is perhaps enhanced by this years very strong Perseid display. The nominal prediction (Marsden 1973,AJ.78,662) is:

T=1992 Nov.25.85 Peri.=153.05
e=0.9633 Node =138.74(1950.0)
Incl.=113.45 q=0.9582 AU

Because of nongravitational effects the uncertainty in T could be as much as +/- 2 months.

B.G.Marsden

IAUC 5330

COMPILED BY D.G.BUCZYNSKI

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First Announcement

Meeting of European (and International) Planetary and Cometary Observers

M E P C O '92

in Violau, Germany (Bavaria)
in the International Space Year 1992
September 18 – 21, 1992

For ten years we, the **Arbeitskreis Planetenbeobachter** (Working Group of Planetary Observers of Germany), have been arranging the Planeten– und Kometen–Tagung (meeting of Planetary and Cometary Observers), which brings together more than 100 amateur observers from German-speaking regions every year.

For the first time, in 1992 we want to invite planet and comet observers from **all over Europe** and also the rest of the world, to open up new European and international perspectives in amateur astronomy as well.

Official language will be English.

We offer:

- a unique meeting atmosphere in a beautiful landscape,
- conference, accomodation and catering in **one** building, the Bruder-Klaus-Heim with the famous Violau Observatory,
- reports and exhibitions regarding the activities in different countries,
- **Proceedings** included in the fee,
- and an astro–geological excursion with scientific guidance.

The full fee for everything, including conference papers, accomodation, full catering and the excursion will be only approx. DM 200,- (approx. FF 650,-).

For pre-registration and further information, please contact
Wolfgang Meyer, Martinstr. 1, D-(W)1000 Berlin 41, Germany